Unit 07

PRACTICAL GEOMETRY

Q. 1 What is a circum-circle of a triangle.

Ans: A circle passing through the three vertices of a triangle is called circum-circle of that triangle.

Q. 2 What is inscribed circle of triangle.

Ans: A circle touching the three sides of a triangle is called inscribed circle or in-circle.

Q. 3 What is an escribed circle of a triangle.

Ans: A circle touching one side of a triangle externally and the other two produced sides internally is called escribed circle or e-circle.

Q. 4 Define a tangent at a point to the circle.

Ans: A line touching a circle at a point and perpendicular to its radius is called tangent to that circle at that point.

Q. 5 Define Direct Common Tangent.

Ans: If the points of contact of common tangent to the two circles are on the same side of the line joining their centres, then this common tangent is called direct common tangent.

Q. 6 Define Transverse Common Tangent.

Ans: If the points of contact of the common tangents of two circles lie on opposite sides of the line joining the centres of the circles then these tangents are called transverse Common Tangents

Q.7 Define the following terms:

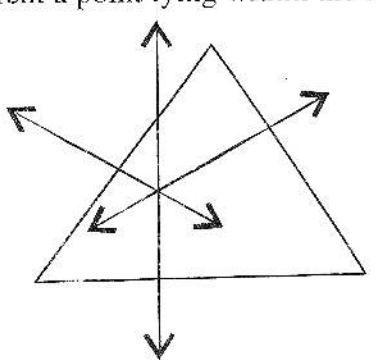
Ans: i) bisector of line segment
ii) Perpendicular bisector
iii) Median
iv) Altitudes
v) bisectors of the angles of triangle.

i) <u>bisector of line segment:</u> A line passing through midpoint of a line segment is called bisector of that line segment.

ii) <u>Perpendicular bisector (right bisector):</u> A bisector of the segment which is perpendicular to the segment is called perpendicular bisector of that angle.

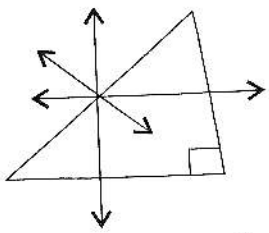
a) <u>An acute angled triangle:</u>

All the three right bisectors of the sides are concurrent a point lying within the triangle.



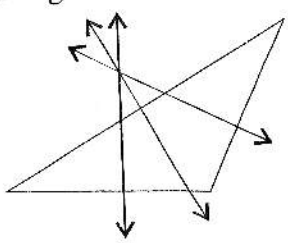
b) <u>A right angled triangle:</u>

All the three right bisectors of the sides, are concurrent at the midpoint of the hypotenuse.



c) An obtuse angled triangle:

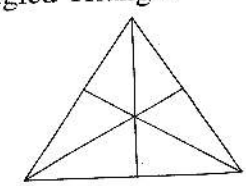
All the three right bisectors of the sides and concurrent at a point lying in the outer region of triangle.



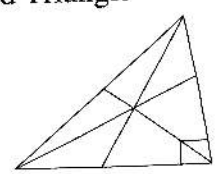
iii) Median : A line segment that joins a vertex of the triangle to the midpoint of the side facing the vertex is called a median of triangle. Median of a triangle are concurrent at a point lying within the triangle.

NOTE:

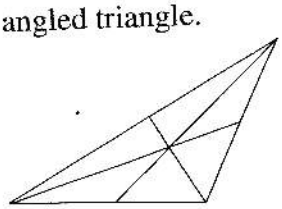
An acute angled Triangle



A right angled Triangle



An obtuse angled triangle.



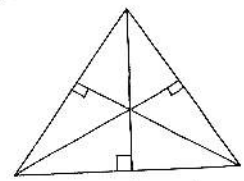
(iv) Altitudes of a triangle:

A perpendicular line segment from a vertex of a triangle to the side facing the vertex is called an altitude of the triangle.

NOTE:

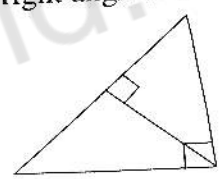
a) An acute angled triangle:

All the three altitudes are concurrent at a point lying within the triangle.



b) A right angled triangle:

All the three altitudes are concurrent at the vertex of the right angled.

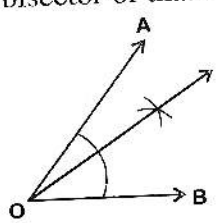


c) An obtuse angled triangle:

All the three altitudes are concurrent at a point lying in the outer region of the triangle.

(iii) Bisector of the angles of a triangle:

A ray that bisects an angle is called the angle bisector of that angle.



Q. 8 What is practical geometry?

Ans: Practical geometry is an important, interesting and useful branch of Mathematics, it deal with practical utility of geometry, it helps to clear the ideas of

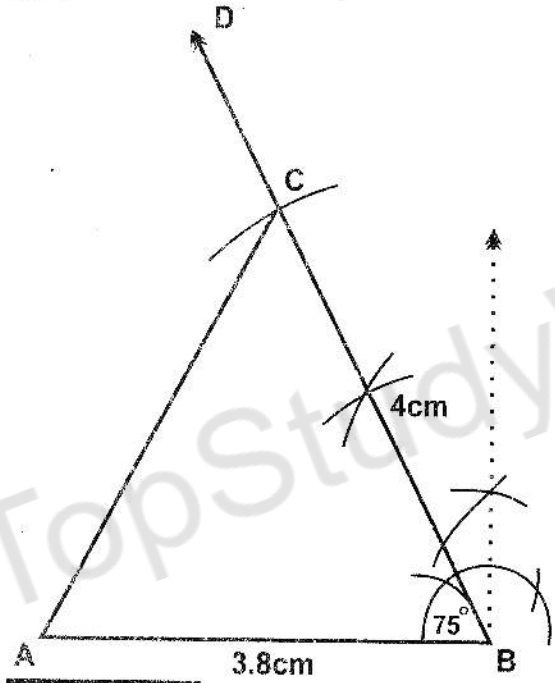
geometry and gives practical explanation of their relations.

EXERCISE 7.1

Q.1 Construct a triangle if possible when

(i) $m\overline{AB} = 3.8cm, m\overline{BC} = 4cm, m\angle B = 75^0$

Sol:



Construction:

i) Draw the line segment $\overline{AB}$ = 3.8 cm

ii) At the point B, draw an angle of measure 75^0

iii) From B, Draw an arc of radius 4cm which cut $\overline{BD}$ at point C.

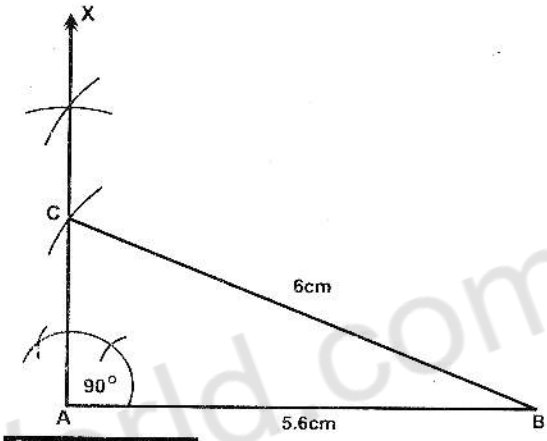
iv) Join the points A and C

Hence ABC is the required triangle

(ii) $m\overline{AB} = 5.6cm,\ m\overline{BC} = 6cm,\ m\angle A = 90^0$

Sol: Here

$m\overline{AB} = 5.6cm., m\overline{BC} = 6cm, m\angle A = 90^0$



Construction:

i) Draw a line segment $\overline{AB} = 5.6cm$

ii) At point A, draw $\angle BAX = 90^0$

iii) With B as centre, Draw an arc of radius 6cm which cut at point C.

iv) Join the points B and C

Hence ABC is the required triangle.

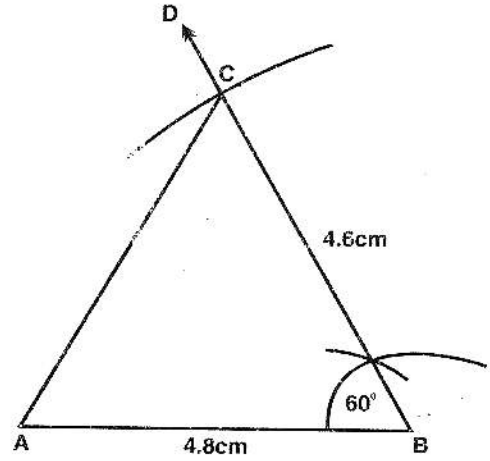
iii. $m\overline{AB} = 4.8cm., m\overline{BC} = 4.6cm., m\angle B = 60^0$

Sol: Given measurements are

$m\overline{AB} = 4.8cm$

$m\overline{BC} = 4.6cm$

$m\angle B = 60^0$



Construction:

i) Draw a line segment $\overline{AB} = 4.8\text{cm}$

ii) At point B, draw an angle of measure 60^0

iii) With B as centre, draw an arc of radius 4.6cm which cut at point C.

iv) Join points A and C

So ABC is the required triangle

(v) $m\angle A = 30^0, m\overline{BC} = 2.5cm., m\overline{AB} = 5cm$

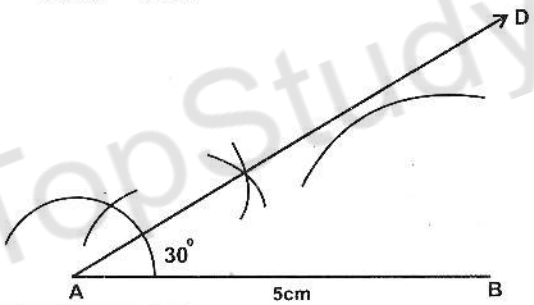
Sol:

Given measurements are

$m\angle A = 30^0$

$m\overline{BC} = 2.5cm$

$m\overline{AB} = 5cm$



Construction:

i) Draw a line segment $\overline{AB} = 5cm$

ii) At point A, draw an angle of measure 30^0

iii) As at point B, we cannot draw an arc of radius 2.5cm. Cutting the line $\overrightarrow{AD}$. So the construction of triangle is not possible.

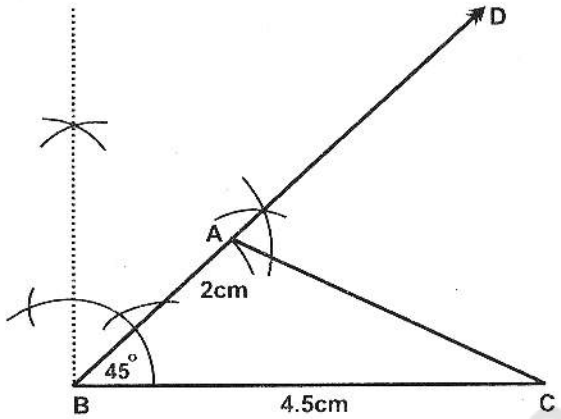
iv) $m\angle B = 45^0, m\overline{BC} = 4.5cm., m\overline{BA} = 2cm$

Sol: Given measurements are

$m\angle B = 45^0$

$m\overline{BC} = 4.5$

$m\overline{BA} = 2cm$



Construction:

i) Draw a line segment $\overline{BC} = 4.5cm$

ii) At point B, draw an angle of measure 45^0

iii) From B, draw an arc of radius 2 cm which cut $\overrightarrow{BD}$ at point A.

iv) Join points A to C

So ABC is the required triangle

(vi) $m\overline{AC} = 6cm, m\overline{CB} = 4cm, m\angle C = 120^0$

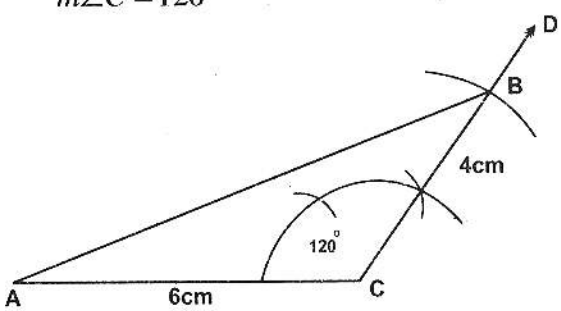
Sol:

Given measurements are

$m\overline{AC} = 6cm$

$m\overline{CB} = 4cm$

$m\angle C = 120^0$



Construction:

i) Draw a line segment $\overline{AC} = 6cm$

ii) At point C, draw an angle of measure 120^0

iii) From C, draw an arc of radius 4cm which cut $\overrightarrow{CD}$ at point B.

iv) Join the point B to A

So, ABC is the required triangle

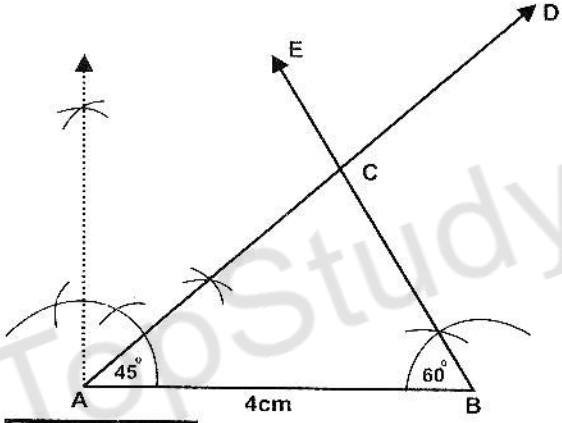
(vii) $m\overline{AB} = 4\text{cm}$, $m\angle A = 45^0$, $m\angle B = 60^0$

Sol: Given measurements are

$m\overline{AB} = 4cm$

$m\angle A = 45^0$

$m\angle B = 60^0$



Construction:

i) Draw a line segment $\overline{AB} = 4\text{cm}$.

ii) At point A, draw an angle of measure 45^o

iii) At point B, draw an angle of measure 60^o which cuts AD at point C.

Hence ABC is the required triangle

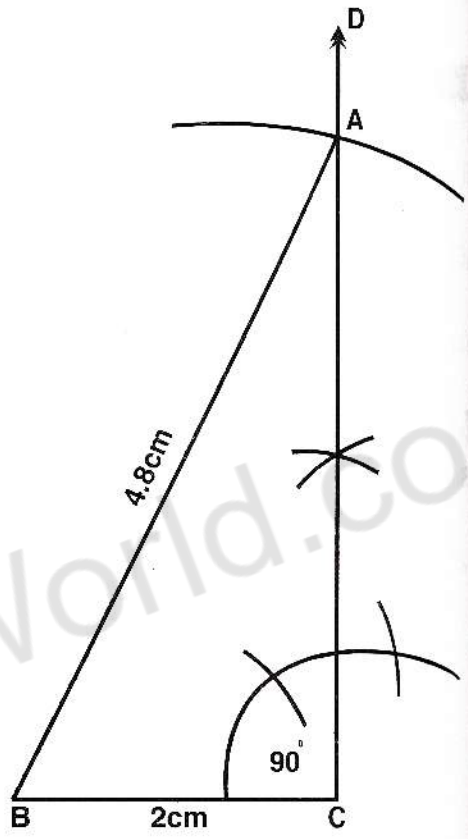
(viii) $m\angle C = 90^0$, $m\overline{AB} = 4.8cm$, $m\overline{BC} = 2cm$

Sol: Given measurements are

$m\angle C = 90^0$

$m\overline{AB} = 4.8cm$

$m\overline{BC} = 2cm$



Construction:

i) Draw a line segment $\overline{BC} = 2\text{cm}$

ii) At point C, draw an angle of measure 90^0

iii) At B as centre, draw an arc of radius 4.8cm which cuts $\overrightarrow{CD}$ at point A.

iv) Join point A to B

So $\triangle$ ABC is the required triangle

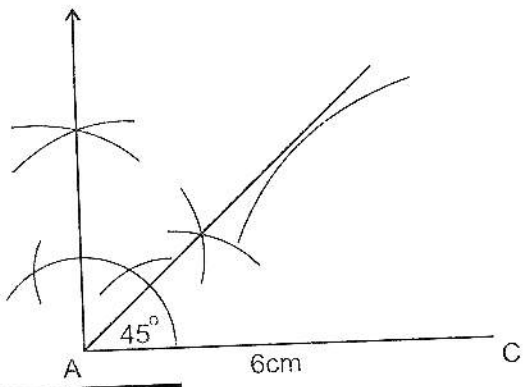
(ix) $m\overline{AB} = 6cm$, $m\overline{BC} = 4cm$, $m\angle A = 45^0$

Sol: Given measurement are

$m\overline{AC} = 6cm$

$m\overline{BC} = 4cm$

$m\angle A = 45^0$



Construction:

i) Draw a line segment $\overline{AC} = 6cm$

ii) At point A, draw an angle of measure 45^0

iii) Taking C as centre, draw an arc of radius 4cm. We observe that it does not intersect the ray of angle 45^0. So construction of Δ ABC is not possible.

(x) m $\angle L = 30^0$, $m\overline{LN} = 4cm.$,

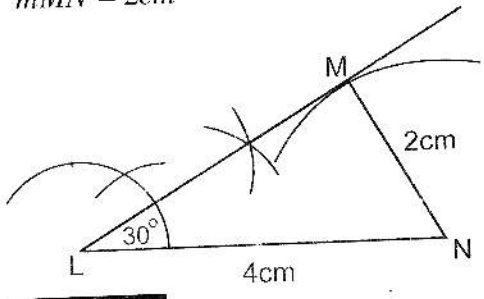
$m\overline{MN} = 2cm$

Sol: Given measurements are

$m\angle L = 30^0$

$m\overline{LN} = 4cm$

$m\overline{MN} = 2cm$



Construction:

i) Draw a line segment $\overline{LN}$ = 4cm

ii) At point L, draw an angle of measure 30^0

iii) Taking N as centre, draw an arc of radius 2cm cutting at point M.

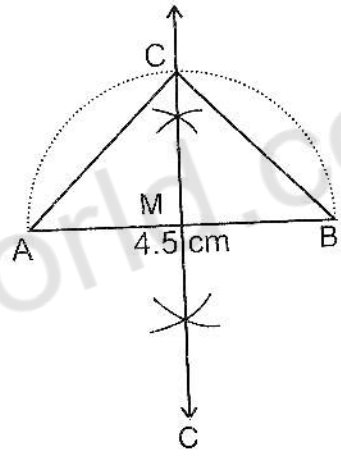
iv) Join M and N

So LMN is the required triangle

Q.2 Construct a right angled isosceles triangle whose hypotenuse is 4.5cm.

Sol:

We want to construct a right angled isosceles triangle whose hypotenuse is 4.5cm



Construction:

i) Draw a line segment $\overline{AB}$ = 4.5

ii) Find midpoint M of $\overline{AB}$.

iii) Taking M as centre and draw a semi circle of radius $\overline{AM}$ or $\overline{BM}$.

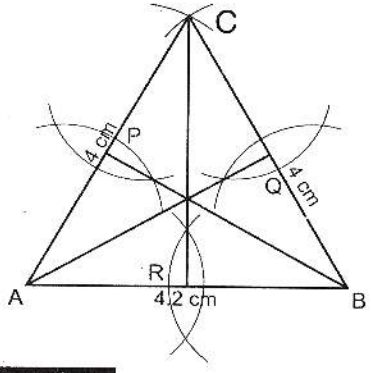
iv) Join A to C and B to C.

So ABC is a right angled isosceles triangle

Q.3 Construct the triangle ABC in which $m\overline{AB}$ = 4.2cm and $m\overline{BC}$ = 4 cm, $m\overline{CA}$ = 4cm. Draw the medians of the triangle. Are they concurrent?

Sol: Given measurements are

$m\overline{AB} = 4.2cm$, $m\overline{CA} = 4cm$, $m\overline{BC} = 4cm$



Construction:

i) Draw a line segment $\overline{AB} = 4.2$ cm

ii) Take centre at A, draw an arc of radius 4cm. Taking B, draw an arc of radius 4cm.

iii) Join point C with A and B. So ABC is required triangle.

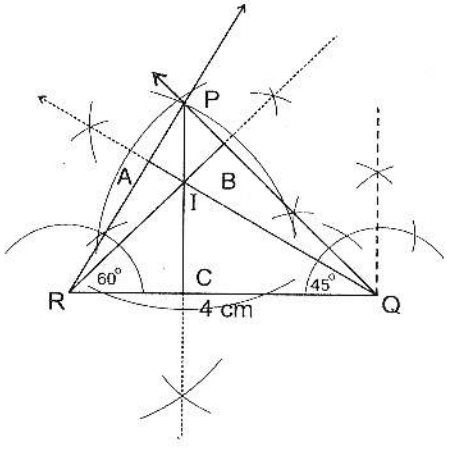
iv) Find mid points R of AB, Q of $\overline{BC}$. and P of AC.

v) Join A to Q, B to P and C to R Thus $\overline{AQ}$, $\overline{PB}$ and $\overline{CR}$ are required medians of triangle ABC. All medians are concurrent.

Q.4 Construct the triangle PQR in which $m\overline{RQ} = 4cm$, $m\angle Q = 45^0$ and $m\angle R = 60^0$. Draw the three altitudes of the triangle. Are they concurrent?

Sol: Given measurements are as

$m\overline{RQ} = 4cm,\ m\angle Q = 45^0 and\ m\angle R = 60^0$



Construction:

i) Draw a line segment $\overline{RQ} = 4$cm.

ii) At point R, draw an angles of measures 60^0

iii) At point Q, draw an angle of measure 45^0

So Δ PQR is required triangle

iv) Draw perpendicular on $\overline{PQ}, \overline{RP}$ and $\overline{RQ}$

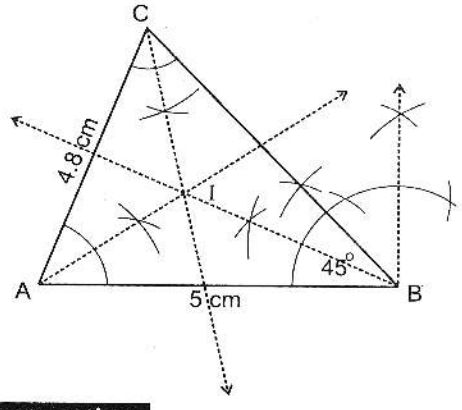
v) Join R to B, Q to A and P to C.

vi) Thus $\overline{RB}, \overline{AQ}$ and $\overline{PC}$ are required altitudes of triangle PQR. All altitudes are concurrent.

Q.5 Draw the bisectors of the angles of a triangle ABC whose sides are $m\overline{AB}$ =5cm $m\overline{AC} = 4.8cm$ and $m\angle B = 45^0$

Sol: Given measurements are

$m\overline{AB} = 5cm,\ m\overline{AC} = 4.8cm\ and\ m < B = 45^0$



Construction:

i) Draw a line segment $\overline{AB} = 5$cm

ii) At point B, draw an angle of measure 45^0

iii) Taking A as centre, draw an arc of radius 4.8cm cutting at C.

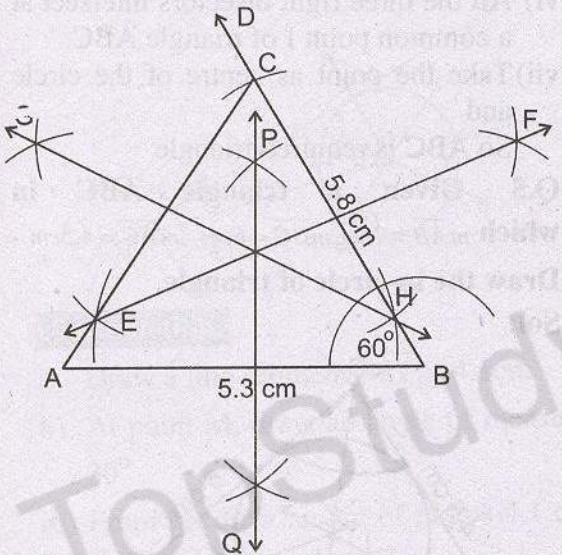
iv) Draw bisector of angle $\angle A$, $\angle B$ and $\angle C$. All three angle bisectors are pass through same point I.

EXERCISE 7.2

Q.1 A triangle where $m\overline{AB}$ = 5.3 cm, $m\overline{BC}$ = 5.8 cm and m∠B = 60^0. Draw the right bisectors of its sides.

Sol: Given measurements are

$m\overline{AB} = 5.3cm,\ m\overline{BC} = 5.8cm\ and\ m < B = 60^0$



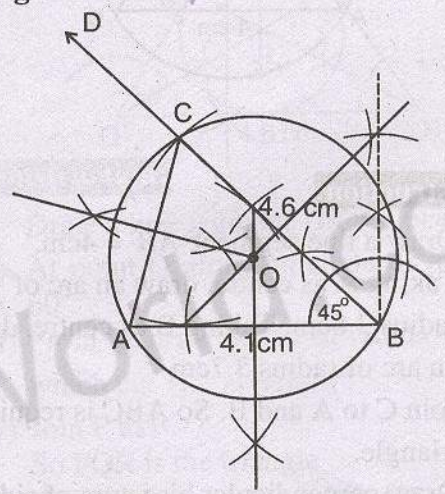
Construction:

i) Draw a line segment $\overline{AB}$ = 5.3cm
ii) Draw an angle of measure 60^0 at point B.
iii) Take B as centre, draw an arc of radius 5.8 cm which cuts $\overrightarrow{BD}$ at point C.
iv) Join C to A. So ABC is required triangle
v) Draw right bisectors of sides $\overline{AB}$, $\overline{BC}$ and $\overline{CA}$ with help of compass.

Thus $\overleftrightarrow{EF}, \overleftrightarrow{GH}\ and\ \overleftrightarrow{PQ}$ are required right bisectors of sides $\overline{BC}$, $\overline{AC}$ and $\overline{AB}$.

All the three right bisectors of triangle are passing through same point.

Q.2 Construct a triangle where 1 $m\overline{AB}$ = 4.1cm $m\overline{BC}$ = 4.6cm and m∠B = 45^0. Draw a circum circle of the triangle

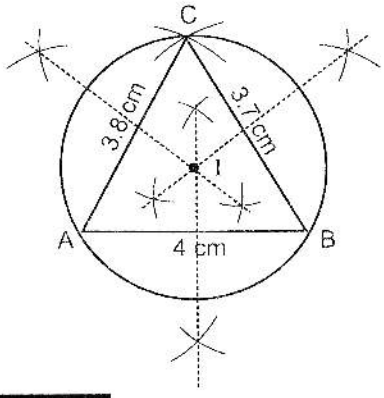


Construction:

i) Draw a line segment $\overline{AB}$ = 4.1 cm
ii) At point B, draw an angle of measure 45^0
iii) From B, draw an arc of radius 4.6 cm which cut the $\overrightarrow{BD}$ at point C.
iv) Join C to A.
v) Draw right bisectors of sides $\overline{AB}$, $\overline{BC}$ and $\overline{CA}$ with help of compass.
vi) All three right bisectors intersect at a common point O of ΔABC.
vii) Take the point O as the centre of the circle and radius equal to the length $m\overline{OA} = m\overline{OB} = m\overline{OC}$, draw the circle. This circle is called circum circle of given triangle.

Q.3 Construct a triangle with sides $m\overline{AB} = 4cm,\ m\overline{BC} = 3.7cm,\ m\overline{AC} = 3.8cm$ Draw a circle passing through three vertices of the triangle. Find also radius of the circle.

Sol:

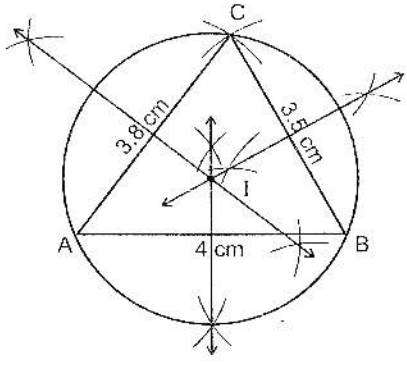


Construction:

i) Draw a line segment $\overline{AB} = 4cm$.
ii) Taking A as centre, draw an arc of radius 3.8cm. Taking B as centre, draw an arc of radius 3.7cm
iii) Join C to A and B. So ABC is required triangle.
iv) Draw perpendicular bisectors of sides. Let I be their point of intersection. Taking I as centre, draw the required circum circle. We observe that the radius is 2.2cm nearly

Q.4 Draw a triangle ABC with sides 3.5cm, 3.8cm and 4cm, then draw a circle passing through its vertices

Sol:

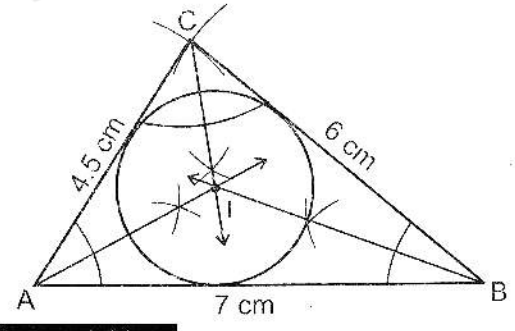


Construction:

i) Draw a line segment $\overline{AB} = 4cm$.
ii) Take A as centre and draw an arc of radius 3.8 cm
iii) Take B as centre, draw an arc of radius 3.5 cm
iv) Join point C to A and B
v) Draw right bisectors of sides. $\overline{AB}$, $\overline{BC}$ and $\overline{CA}$ with the help of compass.
vi) All the three right bisectors intersect at a common point I of triangle ABC.
vii) Take the point as centre of the circle and
So ABC is required triangle

Q.5 Given a triangle ABC in which $m\overline{AB} = 7cm, m\overline{BC} = 6cm$, $m\overline{AC} = 4.5cm$. Draw the in-circle of triangle.

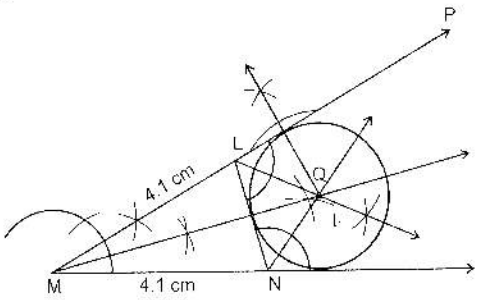
Sol:



Construction:

i) Draw a line segment $\overline{AB} = 7cm$
ii) Taking A as centre, draw an arc of radius 4.5 cm
iii) Taking B as centre, draw an arc of radius 6cm
iv) Join point C to A and B.
So ABC is the triangle.
v) Draw angle bisectors of $\angle A$, $\angle B$ and $\angle C$, let I be their point of intersection.
vi) Draw a circle touches three sides internally of triangle with centre at I which is required inscribed circle.

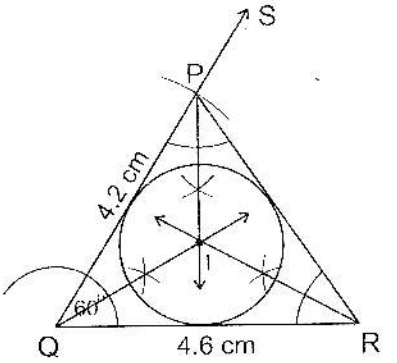
Q.6 Given the triangle LMN in which $m\overline{LM} = m\overline{MN} = 4.1cm,\ m\angle M = 30^0$.
Draw the escribed circle opposite to the vertex M.
Sol:



Construction:

i) Draw a line segment $\overline{MN} = 4.1$cm
ii) At point M, draw an angle of measure 30^0
iii) From M, draw an arc of radius 4.1 cm which cut $\overrightarrow{MP}$ at point L.
iv) Join point L to N
So LMN is the triangle
v) Draw bisectors of angle $\angle$M, $\angle$L and $\angle$N meeting at point I_1.
vi) Draw a circle touches three sides of triangle internally with centre I_1 which is required escribed circle.

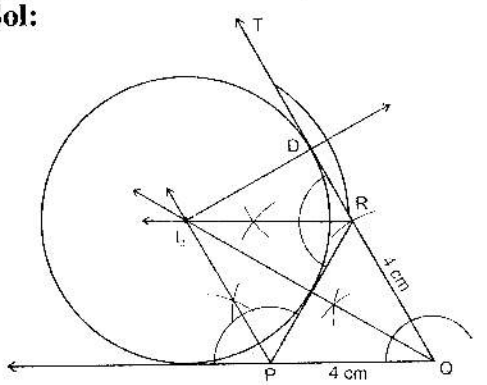
Q.7 Given the triangle PQR having $m\angle Q = 60^0$, $m\overline{QR} = 4.6cm$, $m\overline{PQ} = 4.2cm$.
Draw the inscribed circle (in circle) of the triangle.
Sol:



Construction:

i) Draw a line segment $\overline{QR} = 4.6cm$
ii) At point Q, draw an angle of measure 60^0
iii) From Q, draw an arc of radius 4.2 cm, which cut $\overline{QS}$ at point P.
iv) Join P to R
So PQR is the triangle
v) Draw bisectors of angles $\angle$P, $\angle$Q and $\angle$R. Let I be their point of intersection.
vi) Draw a circle touches three sides of triangle internally with centre at I. which is required inscribed circle.

Q.8 Given the triangle PQR in which $m\overline{PQ} = m\overline{QR}$ = 4cm and $m\angle Q = 60^0$.
Draw the escribed circle (e-circle) opposite to the vertex Q
Sol:



Construction:

i) Draw a line segment $\overline{PQ} = 4$cm
ii) At Q, draw an angle of measure 60^0

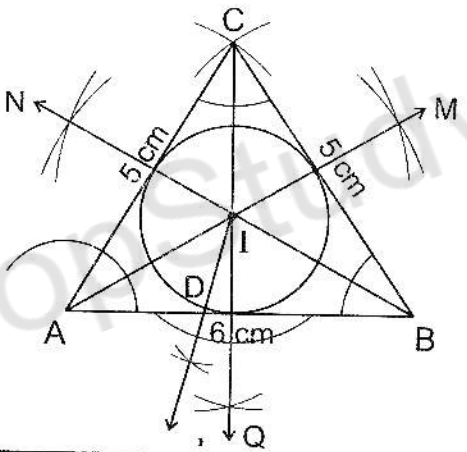
iii) Take centre at Q, draw an arc of radius 4 cm which cut at point R.
iv) Join R to P

So PQR is the triangle

v) Draw the internal bisector of ∠Q. Also draw bisector of ∠SPR and ∠PRT. Let I_2 be their point of intersection. Taking I_2 as centre, we draw the escribed circle.

Q.9 Given a triangle ABC whose sides are $m\overline{AB} = 6cm, m\overline{AC} = 5cm, \overline{BC} = 5cm$. Draw a circle touching its sides internally.

Sol:

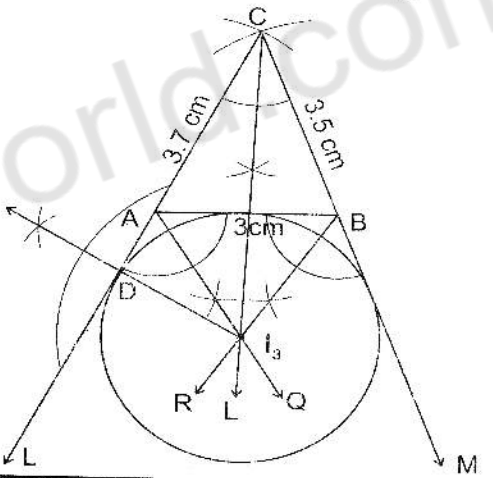


Construction:

i) Draw a line segment $\overline{AB}$ = 6cm.
ii) Take A as centre draw an arc of radius 5cm. Take B as centre, draw an arc of radius 5cm
iii) Join C to A and B so ABC is triangle
iv) Draw bisectors of angles of ∠A, ∠B and ∠C.
v) The three angle bisectors intersect at common point I.
vi) Draw a perpendicular from the point I on AB as ID.
vii) Now take the point I as centre and draw the circle of radius mID. The circle will touch the three sides of triangle internally. This is required inscribed circle.

Q.10 Given a triangle ABC whose sides are $m\overline{AB} = 3cm, m\overline{BC} = 3.5cm, m\overline{AC} = 3.7cm$. Draw a circle touching the smallest side externally and other two produced sides internally.

Sol: Here the smallest side is $\overline{AB}$



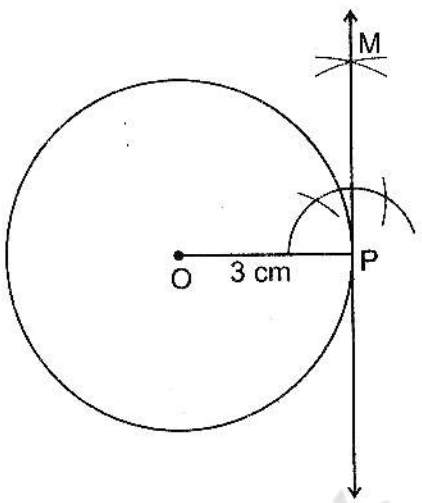
Construction:

i) Draw a line segment AB = 3cm
ii) Taking A and B as centres draw arcs of radii 3.7 cm and 3.5cm
iii) Join C to A and B so ABC is the triangle
iv) Produce AC beyond A and $\overline{BC}$ beyond B.
v) Draw bisector of ∠A, ∠B and ∠C.
vi) All three angle bisectors are concurrent at point I_3.
vii) Draw a perpendicular from Point I_3 on $\overline{AC}$
viii) Draw a circle with centre at I_3 and of radius mI_3D. That will be the required e-circle.

EXERCISE 7.3

Q.1 Take a circle of radius 3cm and draw a tangent at any point D on it.

Sol:

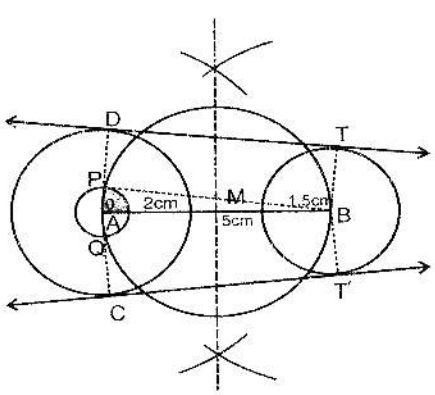


Construction:

i) Draw a circle with centre at O and radius 3cm
ii) Take point P on circle and join it to O.
iii) Construct an angle of measure 90^0 at point P with help of compass.
iv) $\overline{PM}$ is the required tangent at point P on the circle of radius 3cm

Q.2 Draw the direct common tangent to two circles of radii 1.5cm, 2cm, when the distance between their centres is 5cm.

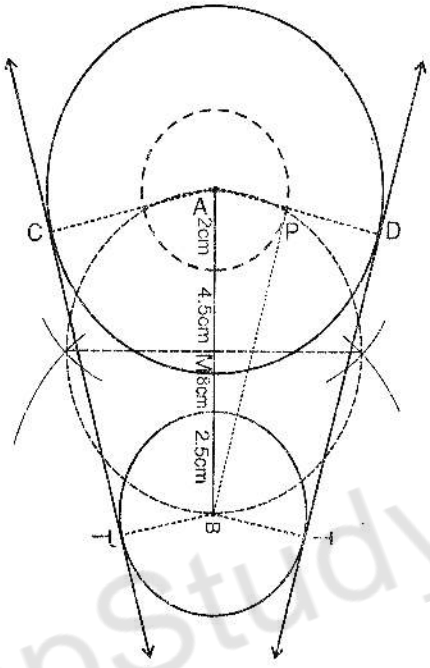
Sol:



Construction:

i) Draw a line segment $\overline{AB}$ = 5cm
ii) Taking points A and B as centre draw two circles of radii 2cm and 1.5cm
iii) By taking, draw a circle of radius 2-1.5 = 0.5 cm (difference of radii of given circles.
iv) Bisect the line segment $\overline{AB}$ at M.
v) Taking centre at M and radius $m\overline{AM} = m\overline{BM}$, draw a circle intersecting the inner circle at P. Join the points A to P and extend AP intersect the concentric circle at D.
vi) Draw a line from the point B parallel to $\overline{AD}$ intersecting the circle with centre at B at point T.
vii) Draw a line joining the points D and T. So the line $\overleftrightarrow{DT}$ is the direct common tangent to the given two circles
viii) Repeat the same process on the other side of $\overline{AB}$ so the line $\overleftrightarrow{CT'}$ is also direct common tangent to the given two circles
ix) Measure the line segments $\overline{DT}$ and $\overline{CT'}$ $m\overline{CT'} = m\overline{DT} = 4.9$cm.

Q.3 Draw the direct common tangent to two circles of radii 2.5 cm and 4.5 cm



when the distance between their centres is 8 cm.

Sol:

Construction:

i) Draw a line segment $\overline{AB} = 8cm$

ii) Take points A and B as centre and draw two circles of radii 4.5cm and 2.5cm respectively

iii) Taking centre at A, draw a circle of radius 4.5 – 2.5 = 2cm (Difference of radii of given circle)

iv) Bisect the line segment $\overline{AB}$ at M.

v) Now taking centre at M and radius $m\overline{AM} = m\overline{BM}$, draw a circle intersecting the inner circle at P. Join the points A to P and extend AP to intersect concentric circle at D.

vi) Draw a line from the point B parallel to $\overline{AD}$ intersecting the circle centre at B at point T.

vii) Draw a line joining the points D and T. then line $\overline{DT}$ is the direct common tangent to given two circles.

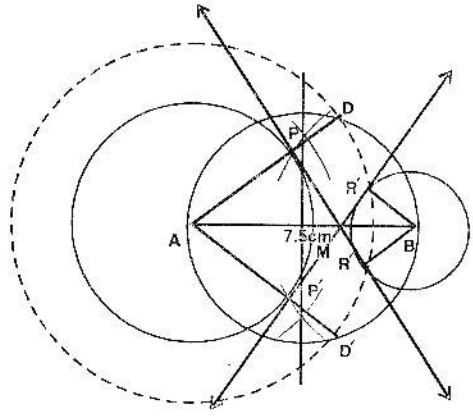
viii) Repeat the same process on the other side so the line $\overline{CT'}$ is also direct common tangent to the given two circles.

ix) Measure the line segments $\overline{DT}$ and $\overline{CT'}$

x) $m\overline{CT'} = m\overline{DT} = 7.7cm.$

Q.4 Take two circles of radius 3cm and 2 cm. When the distance between their centres is 7.5cm. Draw transverse common tangents to them and find the length of segment tangential.

SOL:



Construction:

i) Draw a line segment $\overline{AB}$ = 7.5cm.

ii) Take the centre at A draw a circle of radius 3cm. Take the point B as centre and draw a circle of radius 2cm

iii) By taking point A as centre and radius 2+3 = 5cm draw a circle.

iv) Find M, the mid-point of $\overline{AB}$.

v) Now taking the point M as centre and radius equal to AM = MB. Draw a circle intersecting the circle with centre of points D and D′. Join A to D and D′.

vi) The line segments AD and AD′ intersect with circle with 2cm at point P and P′.

vii) Draw a line from the point B parallel to AP intersecting the circle at R.

viii) Join P and R. the line PR is the required transverse common tangents.

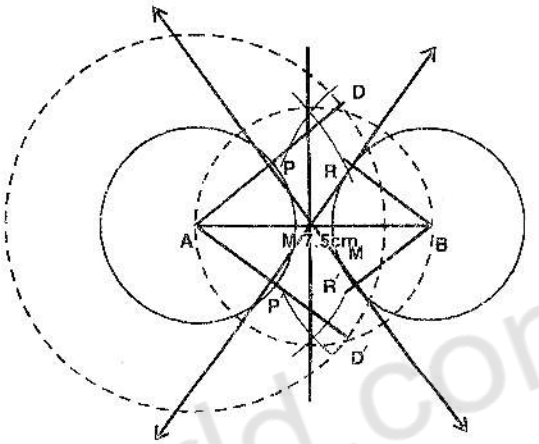
ix) Similarly draw, $\overline{BR'}$ parallel to AD′ and join the points R′ and P′ the line $\overline{P'R'}$ is also a transverse common tangent.

x) The lines PR and P′R′ are required transverse common tangents to given circles.

Measure $\overline{PR}$ and $\overline{P'R'}$ = 5.8cm.

Q.5 Draw transverse common tangents to the two circles having radii 3cm each. Distance between the centres is 7.5cm. Measure the distance of tangential segments

Sol:



Construction:

i) Draw a line segment $\overline{AB}$ = 7.5cm

ii) Take centre at A and draw a circle of radius 3cm Take the point B as centre and draw a circle of radius 3cm.

iii) By taking point A as centre and radius 3+3 = 6cm draw a circle.

iv) Find M, the mid-point of $\overline{AB}$.

v) Now taking the point M as centre and radius equal to AM = MB. Draw a circle intersecting the circle with centre of points D and D′. Join A to D and D′.

vi) The line segments AD and AD′ intersect with circle with 2cm at point P and P′.

vii) Draw a line from the point B parallel to AP intersecting the circle at R.

viii) Join P and R. the line PR is the required transverse common tangents.

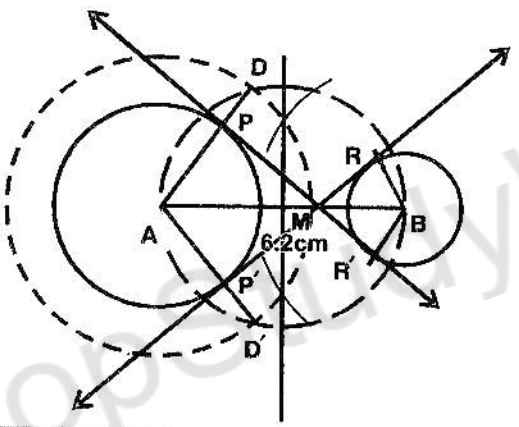
ix) Similarly draw, $\overline{BR'}$ parallel to AD′ and join the points R′ and P′

the line $\overline{P'R'}$ is also a transverse common tangent.

x) The lines PR and P′R′ are required transverse common tangents to given circles.

Measure $\overline{PR}$ and $\overline{P'R'} = 4.7$cm.

Q.6 Draw the transverse tangents of the circles with radius 2.6cm and 1.3 cm. When distance between their centre is 6.2cm



Construction:

i) Draw a line segment $\overline{AB} = 6.2$cm

ii) Taking A as centre & draw a circle of radius 2.6cm Take the point B as centre and draw a circle of radius 1.3cm

iii) By taking point A as centre and radius 2.6+1.3=3.9cm draw a circle.

iv) Find M, the mid-point of $\overline{AB}$.

v) Now taking the point M as centre and radius equal to AM = MB. Draw a circle intersecting the circle with centre of points D and D′. Join A to D and D′.

vi) The line segments AD and AD′ intersect with circle with 2cm at point P and P′.

vii) Draw a line from the point B parallel to AP intersecting the circle at R.

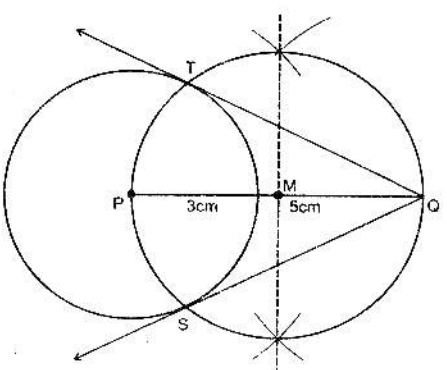
viii) Join P and R. the line PR is the required transverse common tangents.

ix) Similarly draw, $\overline{BR'}$ parallel to AD′ and join the points R′ and P′ the line $\overline{P'R'}$ is also a transverse common tangent.

x) The lines PR and P′R′ are required transverse common tangents to given circles.

Q.7 Distance between two points P and Q is 6.5cm. With centre at P, draw a circle of radius 3cm. Draw tangents from the point Q to the circle. Measure the lengths of tangential segment.

Sol:



Construction:

i) Draw a line segment $\overline{PQ} = 6.5cm$

ii) Draw a circle of radius 3cm taking P as centre

iii) Bisect $\overline{PQ}$ at point M

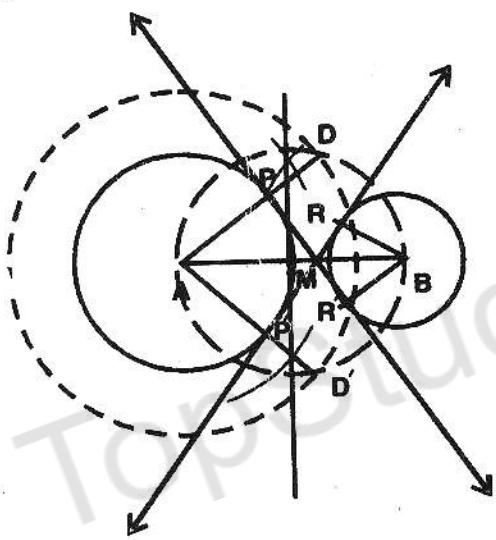
iv) Take M as centre, draw a circle passing through P and Q intersecting

first circle at T and S. So $\overline{QT}$ *and* $\overline{QS}$ are tangents

v) On measurement, $m\overline{QT} = m\overline{QS} = 5.9cm$

Q.8 Draw the transverse common tangents to the circles with radii 2.5cm and 1.5cm when the distance between their centres is 5cm

Sol:



Construction:

i) Draw a line segment $\overline{AB} = 5cm$.

ii) Take the centre at A draw a circle of radius 2.5cm. Take the point B as centre and draw a circle of radius 1.5cm

iii) By taking point A as centre and radius 2.5+1.5 = 4cm draw a circle.

iv) Find M, the mid-point of $\overline{AB}$.

v) Now taking the point M as centre and radius equal to AM = MB. Draw a circle intersecting the circle with centre of points D and D′. Join A to D and D′.

vi) The line segments AD and AD′ intersect with circle with 2cm at point P and P′.

vii) Draw a line from the point B parallel to AP intersecting the circle at R.

viii) Join P and R. the line PR is the required transverse common tangents.

ix) Similarly draw, $\overline{BR'}$ parallel to AD′ and join the points R′ and P′ the line $\overline{P'R'}$ is also a transverse common tangent.

x) The lines PR and P′R′ are required transverse common tangents to given circles.

Measure $\overline{PR}$ and $\overline{P'R'} = 5.9cm$.

Objective

Q. 1. Four answers of each item are given from which only one is true. Tick the correct answer.

1. Practical geometry is the branch of
(a) Mathematics (b) Physics
(c) Biology (d) Chemistry

2. A circle which passes through the three vertices of the triangle is called ____.
(a) circum circle (b) inscribed circle
(c) e-circle (d) tangent

3. Radius of a Circum-Circle is denoted by
(a) R (b) r
(c) Q (d) ∅

4. Centre of Circum-Circle is denoted by
(a) I (b) O
(c) R (d) ∅

5. To draw Circum-Circle of a triangle, we need right bisectors of all its ____.
(a) Sides (b) angles
(c) diameter (d) radius

6. A triangle having one right angle is called _____.
(a) Triangle
(b) Right Angled Triangle
(c) Isosceles Triangle
(d) Acute angle triangle

7. All the three right bisector of sides of any triangle intersect at _____.
(a) Two Points (b) Three Points
(c) Common Point (d) Tangent

8. A circle touching the three sides of a triangle is called _____.
(a) Inscribed Circle
(b) Circum-Circle
(c) Escribed Circle (d) e-circle

9. Radius of in circle is denoted by
(a) r (b) R
(c) ∅ (d) I

10. Centre of inscribed circle is denoted by _____.
(a) O (b) I
(c) e (d) ∅

11. To draw in-circle, Number of perpendicular bisectors of sides of triangle drawn are_____.
(a) 2 (b) 3
(c) 4 (d) 1

12. The bisector of one interior angle and two opposite exterior angles are ____.
(a) congruent (b) concurrent
(c) equal (d) parallel

13. A circle touching one side of triangle externally and the other two produced sides internally is called _____.
(a) in-Circle (b) escribed circle
(c) circum-circle (d) circle

14. Escribed circle is also called ____.
(a) e-circle (b) in-Circle
(c) circum-circle (d) concentric circle

15. Centre of escribed circle is denoted by _____.
(a) I_1 (b) I
(c) e (d) ∅

16. Two tangents can be drawn from a point outside a _____.
(a) parallelogram (b) triangle
(c) rectangle (d) circle

17. Lengths of common tangents are always _____.
(a) unequal (b) equal
(c) not measurable (d) different

18. A line touching a circle at a point and perpendicular to its radius is called _____ to that circle at that point.
(a) tangent (b) secant
(c) cosecant (d) parallel

19. A point dividing the line segment into two equal parts is called_____.
(a) point of trisection (b) midpoint
(c) median (d) altitude

20. A tangent is a line touching a circle at _____.
(a) two points (b) one point
(c) three point (d) no point

21. Half length of diameter of the circle is called its _____. (Lahore Board 2010)
(a) radius (b) centre
(c) tangent (d) mid point

22. The tangents at the end points of the diameter of a circle are _____.
(a) collinear (b) parallel
(c) intersecting (d) perpendicular

23. Two circles of different radii are _____. (Lahore Board 2010)
(a) equal (b) similar
(c) equal in area (d) congruent

24. The number of tangents to a circle that can be drawn from point outside a circle are _____.
(a) two (b) three
(c) none (d) more than two

25. A line passing through mid point of a line segment is called ___ of that line segment.
(a) bisector (b) right bisector
(c) Median (d) angle bisector

26. A bisector of the segment which is perpendicular to the segment is called _____ of the segment.
(a) bisector
(b) perpendicular bisector
(c) altitude
(d) tangent

27. A circle touching side $\overline{BC}$ of a triangle ABC externally and the other two produced sides is called _____.
(a) in-circle (b) circum-circle
(c) e-circle opposite to A
(d) e-circle opposite to B

28. A circle touching side $\overline{AC}$ of a triangle ABC externally and the other two produced sides internally is called _____.
(a) Circum -Circle (b) In-Circle
(c) e-circle opposite to vertex A
(d) e-circle opposite to vertex B

29. A ray that bisects an angle is called the _____ of that angle.
(a) bisector (b) angle bisector
(c) right angle (d) median

30. Right bisector of the sides of a triangle are ____.
(a) concurrent (b) congruent
(c) midpoint (d) parallel

31. Angle bisector of a triangle are concurrent at a point lying _____ the triangle.
(a) within (b) outside
(c) midpoint (d) at hypotenuse

32. If the point of contact of the common tangents of two circles lie on opposite sides of the line joining the centres of the circles then these tangent are called _____.

(a) direct common tangents
(b) transverse common tangents
(c) median common tangents
(d) altitude

33. Distance between the point of contact of each common tangent is _____.

(a) same (b) different
(c) zero (d) concurrent

34. If legs of right angled triangle are 1, 1 then its hypotenuse is ___.

(a) 1 (b) $\sqrt{2}$
(c) 2 (d) Zero

Answers

1.	a	**2.**	a	**3.**	a	**4.**	b	**5.**	a	**6.**	b	**7.**	c
8.	a	**9.**	a	**10.**	b	**11.**	b	**12.**	b	**13.**	b	**14.**	a
15.	a	**16.**	d	**17.**	b	**18.**	a	**19.**	b	**20.**	b	**21.**	a
22.	b	**23.**	b	**24.**	a	**25.**	a	**26.**	b	**27.**	c	**28.**	d
29.	b	**30.**	a	**31.**	a	**32.**	b	**33.**	a	**34.**	b		